Claims

[c1] A method of generating electrical energy from chemically generated hydrogen and oxygen comprising the steps of:
establishing a first reaction compartment;
generating hydrogen gas from a reaction of aluminum metal and aqueous alkali solution in the first reaction compartment;
establishing a second reaction compartment;
generating oxygen gas from a reaction of oxygenated salt, water and a catalyst in the second reaction compartment;
establishing a fuel cell having an anode and cathode;
fluidly coupling the first reaction compartment to the fuel cell anode;
fluidly coupling the second reaction compartment to the fuel cell cathode; and
feeding the hydrogen and oxygen gas to the fuel cell to generate electricity.

[c2] The method of claim 1 further comprising the step of providing a first gas permeable membrane disposed between the first reaction compartment and the fuel cell anode, the first gas permeable membrane adapted to pass hydrogen gas to the fuel cell anode.

[c3] The method of claim 1 further comprising the step of providing a second gas permeable membrane disposed between the second reaction compartment and the fuel cell cathode, the second gas permeable membrane adapted to pass oxygen gas to the fuel cell cathode.

[c4] The method of claim 1 further comprising the step of recycling alkali generated in the second reaction compartment to the first reaction compartment.

[c5] The method of claim 1 further comprising the step of recycling water produced by the fuel cell to the first reaction compartment.

[c6] The method of claim 1 further comprising an array of first reaction compartments fluidly coupled to the fuel cell anode by a first manifold means.

[c7] The method of claim 6 further comprising a controller means adapted to selectively initiate the generation of hydrogen in one or more first reaction compartments as needed.

[c8] The method of claim 1 further comprising an array of second reaction compartments fluidly coupled to the fuel cell cathode by a second manifold means.

[c9] The method of claim 8 further comprising a controller means adapted to selectively initiate the generation of oxygen in one or more second reaction compartments as needed.

[c10] A method of generating electrical energy from chemically generated hydrogen and oxygen comprising the steps of:
establishing a first reaction compartment;
generating hydrogen gas from a reaction of aluminum metal and aqueous alkali solution in the first reaction compartment;
establishing a second reaction compartment;
generating oxygen gas from a reaction of oxygenated salt, water and a catalyst in the second reaction compartment;
establishing a fuel cell having an anode and cathode;
fluidly coupling the first reaction compartment to the fuel cell anode;
fluidly disposing a first gas permeable membrane between the first reaction compartment and the fuel cell anode, the first gas permeable membrane adapted to pass hydrogen gas to the fuel cell anode;
fluidly coupling the second reaction compartment to the fuel cell cathode;
fluidly disposing a second gas permeable membrane between the second reaction compartment and the fuel cell cathode, the second gas permeable membrane adapted to pass oxygen gas to the fuel cell cathode;
feeding the hydrogen and oxygen gas to the fuel cell to generate electricity; and
recycling water produced by the fuel cell to the first reaction compartment.

[c11] A fuel cell apparatus comprising:
a fuel cell means having an anode and cathode;
a first reaction compartment containing aluminum and an alkali;
an initiator control means adapted to generate an initiation signal;
a first initiator conduit fluidly coupled to the first reaction compartment, responsive to the initiation signal the first initiator conduit flows an aqueous

solution into the first reaction compartment whereby hydrogen gas is generated;
a hydrogen gas conduit fluidly coupling the first reaction compartment to the anode;
a second reaction compartment containing oxygenated salt and a catalyst means;
a second initiator conduit fluidly coupled to the second reaction compartment, responsive to the initiation signal, the second initiator conduit flows an aqueous solution into the second reaction compartment whereby oxygen gas is generated;
a hydrogen conduit fluidly coupling the first reaction compartment to the fuel cell anode; and
an oxygen conduit fluidly coupling the second reaction compartment to the fuel cell cathode.

[c12] The fuel cell apparatus of claim 11 further comprising a first gas permeable membrane disposed between the first reaction compartment and the fuel cell anode, the first gas permeable membrane adapted to pass hydrogen gas to the fuel cell anode.

[c13] The fuel cell apparatus of claim 11 further comprising a second gas permeable membrane disposed between the second reaction compartment and the fuel cell cathode, the second gas permeable membrane adapted to pass oxygen gas to the fuel cell cathode.

[c14] The fuel cell apparatus of claim 11 further comprising a water recycling conduit fluidly coupling the first reaction compartment to the fuel cell means whereby water produced by the fuel cell reaction is reused in the first reaction compartment.

[c15] The fuel cell apparatus of claim 11 wherein an array of first reaction compartments are fluidly coupled to the fuel cell anode by a first manifold means.

[c16] The fuel cell apparatus of claim 15 further comprising a controller means

adapted to selectively initiate the generation of hydrogen in one or more first reaction compartments.

[c17] The fuel cell apparatus of claim 11 wherein an array of second reaction compartments are fluidly coupled to the fuel cell cathode by a second manifold means.

[c18] The fuel cell apparatus of claim 17 further comprising an controller means adapted to selectively initiate the generation of oxygen in one or more second reaction compartments.